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SMART & SCALABLE DATA CENTERS

# MIL - DC12

## RIBA3 - Stage

## T04 - GENSETS - Data Sheet -Genset and Dry-Cooler

Date : 31/08/2024

Reference : T-TD23059-55-A

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**Document identification file**

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# MIL - DC12

## RIBA3 - Stage

## T04 - GENSETS - Data Sheet -Genset and Dry-Cooler

| | |
|---|---|
| N° project | T-TD23059 |
| Date *(last version)* | 31/08/2024 |
| Reference / version | T-TD23059-55-A |
| File name | D4-MIL-DC12-RIBA3-T04-CAP-DSH-ALL-ALL-001-Datasheet Genset |
| Pages | 11 |

| Version | Date | Review | Editor | Auditor | Approver |
|---|---|---|---|---|---|
| A | 31/08/2024 | First emission | ☒ M.FUENTES | ☒ C.MOUCADEAU | ☒ A.FONTAINE |
| | | | ☐ | ☐ | ☐ |
| | | | ☐ | ☐ | ☐ |
| | | | ☐ | ☐ | ☐ |

☒ *: document verified / approved*

| CLIENT | CAMPUS | PROJECT | PHASE | TRADE | AUTHOR | TYPE | STEP | LEVEL | NUMBER | VERSION |
|---|---|---|---|---|---|---|---|---|---|---|
| D4 | MIL | DC12 | RB3 | T04 | CAP | DSH | ALL | ALL | 001 | A |

# KOHLER

## Industrial Diesel Generator Set – KD4000-E
## 50 Hz - Emission Optimized – EPA Tier 2 Compliant

| RATINGS 11000 V - 50 Hz | | |
|---|---|---|
| Standby | kVA | 4050 |
| | kWe | 3240 |
| Data Center / Mission Critical | kVA | 4050 |
| | kWe | 3240 |
| Prime | kVA | 3680 |
| | kWe | 2945 |

HVO

### Benefits & features

**KOHLER premium quality**

- KOHLER provides **one source responsibility** for the generating set and accessories
- The generator set, its components and a wide range of options have been **fully developed, prototype tested, factory built**, and production-tested
- Generators sets are designed in accordance with ISO8528-5, performance class G3
- Generators sets accept the rated load in one step outside the ISO8528-5 operating limit values
- Approved for use with HVO (Hydrotreated Vegetable Oil) according to EN15940

**KOHLER premium performances**

**Engines**

- Low fuel consumption thanks to a high technology common rail injection engine
- A smaller footprint thanks to a high power density
- Low temperature starting capability
- Long maintenance interval

**Alternator**

- Provide industry leading motor starting capability
- Excitation system to permit sustained overcurrent > 300% In, during 10 sec
- Built with a class H insulation and IP23

**Cooling**

- A flexible solution using an electrical driven radiator fan
- High temperature and altitude product capacity available

**Control Panel**

- The KOHLER wide controller range provide the reliability and performances you expect from your equipment. You can program, manage and diagnose it easily and in an efficient way

**KOHLER worldwide support**

- A standard three-year or 1000-hour limited warranty for standby applications.
- A standard two-year or 8700-hour limited warranty for prime power applications.
- A worldwide product support

| GENERAL SPECIFICATIONS | |
|---|---|
| Engine brand | KOHLER KD Series |
| Alternator commercial brand | LEROY SOMER |
| Voltage (V) | 11000V - 50Hz |
| Standard Control Panel | M80-D |
| Optional control panel | APM802 |
| Emission level | Emission optimization |
| Type of Cooling | None |
| Performance class | G3 |
| One step load acceptance (out of ISO criteria) | 100% |

| GENERATOR SETS RATINGS | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Standby | | | Data Center / Mission Critical | | Prime | |
| Voltage | kWe | kVA | Amps | kWe | kVA | kWe | kVA |
| 11000/6350 | 3240 | 4050 | 213 | 3240 | 4050 | 2945 | 3680 |

| DIMENSIONS COMPACT VERSION | |
|---|---|
| Length (mm) | 6686 |
| Width (mm) | 2248 |
| Height (mm) | 2829 |
| Tank capacity (L) | - |
| Dry weight (kg) | 26000 |

| DIMENSIONS SOUNDPROOFED VERSION | |
|---|---|
| Type soundproofing | NOT AVAILABLE |

# KOHLER. Industrial Diesel Generator Set – KD4000-E
## 50 Hz - Emission Optimized – EPA Tier 2 Compliant

### Engine

| General | |
|---|---|
| Engine brand | KOHLER KD Series |
| Engine ref. | KD103V20-5BES * |
| Air inlet system | Turbo |
| Fuel | Diesel Fuel/HVO |
| Emission level | Emission optimization |
| Cylinder configuration | V |
| Number of cylinders | 20 |
| Displacement (l) | 103.43 |
| Bore (mm) * Stroke (mm) | 175 * 215 |
| Compression ratio | 16 : 1 |
| Speed 50Hz (RPM) | 1500 |
| Maximum stand-by power at rated RPM (kW) | 3608 |
| Piston type & material | Forged Steel |
| Charge Air coolant | Air/Water |
| Frequency regulation, steady state (%) | +/- 0.25% |
| Injection Type | Direct |
| Governor type | Electronic |
| Air cleaner type, models | Dry |

| Fuel system | |
|---|---|
| Maximum fuel pump flow (l/h) | 1200 |
| Max head on fuel return line (m fuel) | 3,50 |
| Maximum allowed inlet fuel temperature (°C) | 70 |

| Consumption with cooling system | PRP | ESP |
|---|---|---|
| Consumption @ 100% load (g/kW.h) | 195 | 194 |
| Consumption @ 75% load (g/kW.h) | 210 | 205 |
| Consumption @ 50% load (g/kW.h) | 218 | 215 |
| Consumption @ 25% load (g/kW.h) | 246 | 242 |

**Emissions**

| Lubrication System | |
|---|---|
| Oil system capacity including filters (l) | 700 |
| Min. oil pressure (bar) | 3.70 |
| Max. oil pressure (bar) | 11 |
| Oil sump capacity (l) | 575 |
| Oil consumption 100% ESP 50Hz (l/h) | 1.69 |

| Air Intake system | |
|---|---|
| Max. intake restriction (mm H2O) | 510 |
| Combustion air flow (l/s) | 4781 |

**Exhaust system**

| | PRP | ESP |
|---|---|---|
| Exhaust gas flow (L/s) | 11352 | 12311 |
| Exhaust gas temperature @ ESP (°C) | 460 | |
| Heat rejection to exhaust (kW) | 2530 | |
| Max. exhaust back pressure (mm H2O) | 850 | |

| Optional cooling system (HT/LT) | |
|---|---|
| Type of coolant | GENCOOL |
| Radiated heat to ambient (kW) | 160 |
| Heat rejection to coolant HT (kW) | 1200 |
| HT circuit flow rate (l/min) | 1950 |
| Outlet coolant temperature (°C) | 95 |
| Coolant capacity HT, engine only (l) | 295 |
| Max coolant temperature, Shutdown (°C) | 103 |
| Restriction pressure drop off engine – HT circuit (mbar) | 700 |
| Minimal pressure before HT pump (mbar) | 400 |
| Max. pressure at inlet of HT water pump (mbar) | 2500 |
| Thermostat begin of opening HT (°C) | 71 |
| Thermostat end of opening HT (°C) | 81 |
| HT Standard pressure cap setting (kPa) | 100 |
| Heat rejection to coolant LT (kW) | 1000 |
| LT circuit flow rate (l/min) | 700 |
| Temperature of inlet to LT engine water circuit (°C) | 55 |
| Coolant capacity LT, engine only (l) | 105 |
| Restriction pressure drop off engine – LT circuit (mbar) | 700 |
| Minimal pressure before LT pump (mbar) | 400 |
| Max. pressure at inlet of LT water pump (mbar) | 2500 |
| LT Standard pressure cap setting (kPa) | 100 |

* Engine reference may be partially modified depending on genset application, options selected by the customer and lead time required.

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# KD4000-E

Diesel 50Hz generator set DATA SHEET - OPTIMIZED ON EMISSIONS

## CHARACTERISTICS OF THE ENGINE

| | | | |
|---|---|---|---|
| Template: | KD103V20 | Bore: | 175 mm (6.89") |
| Type: | Cylinder 4-stroke, 20 V | Course : | 215 mm (8.46") |
| Aspiration: | Turbocharged, supercharged air cooled | Displacement: | 103 l (6311 cubic inches) |
| Compression ratio: | 16:0:1 | | |
| Control system for emissions: | Direct diesel injection, engine control module, turbocharger, booster air cooler | | |

| EMISSION (EXHAUST) DATA: | | 5-mode weighted EPA D2 cycle |
|---|---|---|
| HC | | 0.4 g/kWh |
| NOx | (nitrogen oxides as $NO_2$) | 6.0 g/kWh |
| CO | (carbon monoxide) | 0.7 g/kWh |
| PM | (particles) | 0.1 g/kWh |

## EMISSION DATA

| Point in the cycle | 100% ESP | | 100% PRP | | 75% ESP | | 75% PRP | | 50% PRP | |
|---|---|---|---|---|---|---|---|---|---|---|
| Power [kW] | 3608 | | 3280 | | 2706 | | 2460 | | 1640 | |
| Speed [tr/min] | 1500 | | 1500 | | 1500 | | 1500 | | 1500 | |
| NOx [g/kWh] | 11,3 | | 8,9 | | 5,32 | | 5,1 | | 5,23 | |
| CO [g/kWh] | 0,11 | | 0,14 | | 0,34 | | 0,38 | | 1,0 | |
| HC [g/kWh] | 0,25 | | 0,26 | | 0,30 | | 0,33 | | 0,5 | |
| PM [g/kWh] | 0,004 | | 0,004 | | 0,017 | | 0,02 | | 0,07 | |
| | to 5% O2 | to 15% O2 | to 5% O2 | to 15% O2 | to 5% O2 | to 15% O2 | to 5% O2 | to 15% O2 | to 5% O2 | to 15% O2 |
| HC [mg/Nm3] | 87 | 32 | 87 | 33 | 93 | 35 | 101 | 38 | 151 | 56 |
| NO x[mg/Nm3] | 3916 | 1469 | 2991 | 1122 | 1641 | 615 | 1567 | 588 | 1575 | 590 |
| CO [mg/Nm3] | 39 | 15 | 46 | 17 | 105 | 39 | 117 | 44 | 302 | 113 |
| PM [mg/Nm3] | 1,4 | 0,5 | 1,3 | 0,5 | 5,2 | 2,0 | 5,8 | 2,2 | 21,2 | 7,9 |

## TEST METHODS AND CONDITIONS

Test methods:

Emissions at steady state recorded to ISO8178-1 during operation at nominal engine speed ( 2%) and declared constant load ( 2%) with stabilized temperatures, pressures and rated engine emissions.

Fuel Specifications: Diesel EN590

Reference conditions:
Air inlet temperature: 25°C (77°F)
Fuel inlet temperature: 40°C (104°F)
Barometric pressure: 100 kPa (29.53 in. Hg) Humidity: 10.7 g/kg (75 grains H2O/lb) dry air. Intake restriction set at limit maximum allowable for a clean filter; Exhaust back pressure set to maximum allowable limit.

Data is from a single engine test conducted in accordance with the test methods whose fuel specifications and reference conditions are mentioned belowon, and depend on the instrumentation and possible variations from one engine to another. Any test performed using different test methods, instrumentation, fuel specifications and reference conditions may give different results.

Data and specifications subject to change without notice.

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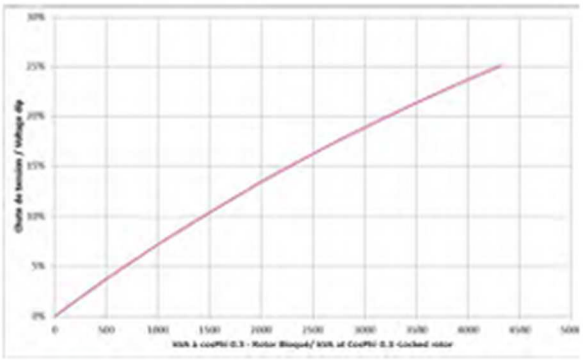
# Industrial Diesel Generator Set – KD4000-E
## 50 Hz - Emission Optimized – EPA Tier 2 Compliant

| Alternator Specifications | |
|---|---|
| Alternator commercial brand | LEROY SOMER |
| Kohler Alternator description | KH08890T |
| Number of pole | 4 |
| Number of bearing | Dual Bearing |
| Technology | Brushless |
| Indication of protection | IP23 |
| Insulation class | H |
| Number of wires | 06 |
| AVR Regulation | Yes |
| Coupling | Direct |
| Capacity for maintaining short circuit at 3 In for 10 s | Yes |
| **Application data** | |
| Overspeed (rpm) | 2250 |
| Power factor (Cos Phi) | 0.80 |
| Voltage regulation at established rating (+/- %) | 0.50 |
| Wave form : NEMA=TIF | <50 |
| Wave form : CEI=FHT | <2 |
| Total Harmonic Distortion in no-load DHT (%) | <3.5 |
| Total Harmonic Distortion, on linear load DHT (%) | <3.5 |
| Recovery time (Delta U = 20% transcient) (ms) | 500 |
| **Performance datas** | |
| Continuous Nominal Rating 40°C (kVA) | 3780 |
| Unbalanced load acceptance ratio (%) | 8 |

Peak motor starting (kVA) based on x% voltage dip power factor at 0.3



**Alternator Standard Features**

- All models are brushless, rotating-field alternators
- NEMA MG1, IEEE, and ANSI standards compliance for temperature rise and motor starting
- The AVR voltage regulator provides superior short circuit capability
- Self-ventilated and dip proof construction
- Sustained short-circuit current of up to 300% of the rated current for up to 10 seconds
- Superior voltage waveform

*Note: See Alternator Data Sheets for alternator application data and ratings, efficiency curves, voltage dip with motor starting curves, and short circuit decrement curves.*

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# Industrial Diesel Generator Set – KD4000-E
## 50 Hz - Emission Optimized – EPA Tier 2 Compliant

**Dimensions compact version**

| | |
|---|---|
| Length (mm) * Width (mm) * Height (mm) | 6686 * 2248 * 2829 |
| Dry weight (kg) | 26000 |
| Tank capacity (L) | - |

* dimensions and weight without options

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## Industrial Diesel Generator Set – KD4000-E
## 50 Hz - Emission Optimized – EPA Tier 2 Compliant

### M80-D

The M80-D can be used as a basic terminal block for connecting a control unit and as an instrument panel with a highly intuitive LCD screen giving an overview of your generating set's basic parameters:

- Oil gauge
- Coolant temperature
- Oil temperature
- Engine speed
- Battery voltage
- Charge air temperature
- Fuel consumption
- etc.

The engine main functions can be controlled and events are recorded to facilitate diagnostics:

- Starting
- Speed adjustment
- Stopping
- Droop
- etc.

### APM802

ADVANCED POWER PLANT MANAGEMENT CONTROL
Dedicated to power plant management APM802 provides advanced control, system monitoring, and system diagnostics for optimum performance and compatibility

- Graphic display with touchscreen
- User language selectable
- Specially researched ergonomics
- High level of equipment availability
- USB and Ethernet ports
- Modbus protocol
- Making it easy to extend the installation
- Complies with the international standard IEC 61131-3

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# Industrial Diesel Generator Set – KD4000-E
## 50 Hz - Emission Optimized – EPA Tier 2 Compliant

### STANDARD SCOPE OF SUPPLY

All our KD Series gensets are fitted with:

- Industrial water cooled DIESEL engine
- Electric starter & charge alternator 24 V D.C
- Electronic governor
- Standard air filter
- Single bearing alternator IP 23 T° rise/ insulation to class H/H
- Welded steel base frame with 85% vibration attenuation mounts
- M80-D control panel
- Flexible fuel lines & lub oil drain pump
- Fuel water separator filter
- Exhaust outlet with flexible and flanges
- User's manual (1 copy)
- Packing under plastic film
- Delivered with oil

### STANDARD DELIVERY

All our gensets are fitted with:

- Industrial water-cooled DIESEL engine
- Electric starter & charge alternator
- Standard air filter
- Electric circuit breaker, adapted to the short-circuit current of the generating set
- Single bearing alternator IP 23 T° rise/ insulation to class H/H
- Welded steel base frame with 85% vibration attenuation mounts
- frame height optimized to allow it to be moved safely by forklift
- enclosure made of new high-quality European steel with enhanced corrosion resistance
- enclosures and base frames tested and analyzed by the French Corrosion Institut
- 100% of tanks tested for permeability
- Personal protection ensured by protective grilles on hot and rotating parts
- Separate 9 dB(A) silencer
- Fuel tank welded inside the genset frame
- Retention bund included for gensets up to 250 kVA ESP
- Emergency stop button on the outside
- Flexible fuel lines & lub oil drain cock
- Exhaust outlet with flexible and flanges
- User's manual (1 copy)
- Packing under plastic film

### POWER RATINGS DEFINITION according to ISO8528-1 (2018-02 edition) and ISO-3046-1

**Emergency Standby Power (ESP):** The standby rating is applicable to varying loads for the duration of a power outage. There is no overload capability for this rating. Average load factor per 24 hours of operation is <85%.

**Prime Power (PRP):** At varying load, the number of generator set operating hours is unlimited. A 10% overload capacity is available for one hour within 12 hour of operation. Average load factor per 24 hours of operation is <75%.

**Data Center Mission Critical (DCP):** Data Center Mission Critical power is defined as being the maximum power which a generating set is capable of delivering while supplying a variable or continuous electrical load and during unlimited run hours. Depending on the sites to supply and the availability of reliable utility, the generating set manufacturer is responsible to define what power level is able to supply to fulfil that requirement including hardware or software or maintenance plan adaptation.

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# Industrial Diesel Generator Set – KD4000-E
## 50 Hz - Emission Optimized – EPA Tier 2 Compliant

### TERMS OF USE

According to the standard, the nominal power assigned by the genset is given for 25°C Air Intlet Temperature, of a barometric pressure of 100 kPA (100 m A.S.L), and 30% relative humidity. For particular conditions in your installation, refer to the derating table.

### WARRANTY INFORMATIONS

Standard Warranty Period:

- for Products in "back-up" service
  - 30 months from the date the Product leaves the plant, **extended to 42 months for KD series**
  - 24 months from the Product's commissioning date, **extended to 36 months for KD series**
  - 1,000 running hours

  The warranty expires when one of the above conditions is met.

- for Products in "continuous" service (continuous supply of electricity, either in the absence of any normal electricity grid or to complement the grid),
  - 18 months from the date the Product leaves the plant, **extended to 30 months for KD series**
  - 12 months from the Product's commissioning date, **extended to 24 months for KD series**
  - 2,500 running hours, **extended to 8700 running hours for KD series**

  The warranty expires when one of the above conditions is met.

For more details regarding conditions of application and scope of the warranty please refer to our General "terms & conditions of sales".

# TECHNICAL DATASHEET

| PRODUCT DESCRIPTION: | FLOWGRID-24000262140 2270KW 43C AIR ON HORIZONTAL SINGLE CIRCUIT RADIATOR |
|---|---|

| General Specifications: | | |
|---|---|---|
| Lenght(L): | | 11240 mm (approx.) |
| Width(W): | | 2400 mm (approx.) |
| Height(H): | | 1800 mm (approx.) |
| Weight(Empty): | | 3190 kg (approx.) |
| Weight(Filled): | | 3690 kg (approx.) |
| Inlet Collector: | (Single Inlet) | 139,7 (5") |
| Outlet Collector: | (Single Outlet) | 139,7 (5") |
| Collection Positions: | Same Side | |

| Heat Exchange Specifications: | Single Circuit | |
|---|---|---|
| Capacity | 2276,96 | kW |
| Exchange Surface | 4128,15 | $m^2$ |
| Exchange Coefficent | 37,71 | $W/m^2K$ |

| Air Side Specifications: | Single Circuit | | |
|---|---|---|---|
| Altitute | 100 | | m |
| Max. Air on temperature | 43 | | $C^o$ |
| Air outlet Temperature | 72,7 | | $C^o$ |
| Inlet Humidity | 50 | | % |
| Outlet Humidity | 12,4 | | % |
| Volumetric flow(Inlet/Outlet) | 259.500 | 283.863 | $m^3/h$ |
| Mass Flow | 274.281 | | kg/h |
| Velocity(Outlet) | 3,38 | | m/s |
| Pressure Drop | 100,8 | | Pa |

| Coolant Side Specifications: | Single Circuit | | |
|---|---|---|---|
| Coolant | Water + 40% Eth. Glycol | | (-23°C) |
| Inlet Temperature | 88,2 | | $C^o$ |
| Outlet Temperature | 56,8 | | $C^o$ |
| Flow Rate | 69,00 | | m3/h |
| Velocity in the tubes | 0,94 | | m/s |
| Velocity in Collectors | 1,42 | | m/s |
| Inner Volume | 496,47 | | lt. |
| Pressure Drop | 31,89 | | kPa |

| Coil Specifications:: | Single Circuit | |
|---|---|---|
| Tube Material | Copper | |
| Fin Material | Aluminium | |
| Fin Type | Flat | |
| Collector Material | Steel Pipe | |
| Tube thickness | 0,35 | mm |
| Fin thickness | 0,15 | mm |
| Fin Pitch | 2,2 | mm |

| Fan Specifications: | FLOWGRID |
|---|---|
| Number of Fans | 18 pcs |
| Diameter of fan | 800 mm |
| Fan RPM | 891 rpm |
| Adjustable Angle | no |

| Electric Motor Specifications: | FLOWGRID |
|---|---|
| Power consumption per electric motor | 1,50 Kw |
| Power consumption per radiator | 27,00 Kw |
| Installed Electric Motor Power | 1,94 Kw |
| Voltage | 400 V |
| Frequency | 50 Hz. |
| Phaze | 3 |
| Insulation Class | F |
| Protection Class | IP54 |
| Thermal Overload Protection | Yes |
| Anti Condensation Heater | no |

| Sound Power and Pressure Level: | |
|---|---|
| Sound Power Level per Radiator | 95 LwA (dBA) |
| Sound Pressure Level@1m. | 71 LpA (dBA) |
| Sound Pressure Level@7m.. | 63 LpA (dBA) |
| Sound Pressure Level@10m.. | 61 LpA (dBA) |

*** Sound Power Level Calculations is carried out in accordance with DIN EN ISO 13487 directives.

PRELIMINARY